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Comparative Vegetational Recovery on Firelines Cleared with Explosives and with Handtools

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ABSTRACT

Vegetational recovery was compared on firelines constructed in three ground fuel cover types, using conventional handtools and two types of fireline explosives. Measurement of ground coverage of shrub and herb species before and after disturbance indicated similar vegetational recovery on blasted and hand-dug fireline.

KEYWORDS: wildland fire, fire control, vegetation, environmental impact

Although the chainsaw, shovel, and pulaski remain basic tools for making firelines, special explosive packages have become a promising alternative. The advantages of blasting fireline in terms of cost, timeliness, and general effectiveness have been established (Barney 1984). But fire managers also are concerned about the environmental impacts of blasting.

Blasting evokes images of violent disturbance to the site. Examination of newly blasted fireline suggested that blasted fireline does not disturb the site more than line dug with handtools. But the question of comparative vegetational recovery remained unanswered. This report presents initial results of a study to investigate early vegetational recovery following disturbance.

Objectives of the study were to: (1) determine amount and kind of vegetation before and after constructing fireline with handtools and with explosives; and (2) compare vegetation recovery on the disturbed areas.

METHODS

The fireline study was done in conjunction with firefighter training on the Ninemile Ranger District, Lolo National Forest, MT. Firelines were dug with handtools and blasted with two explosives used by the Forest Service to blast firelines: a dry chemical charge (Fireline Cord, manufactured by Ensign-Bickford[2]) and water-gel (Iremite 60, manufactured by IRECO) (Barney 1984). Vegetation was evaluated prior to fireline construction in 1983, and afterwards in 1984. Because vegetation succession is so dependent upon initial vegetation response, long-term monitoring was not considered necessary to accomplish the study objectives.

The three fireline construction methods were tested in each of three fuel conditions. Firelines were generally constructed parallel to each other at each site. Replications were not made in this preliminary study. An attempt was made, however, to construct each line within fuel type (Barney 1984) in similar conditions. The light, medium, and heavy fuel types represent fuel models 2, 8, and 10, respectively (Anderson 1982). Fuels (Stockstad and others 1986) graded from light to medium in a Douglas-fir (*Pseudotsuga menziesii*) habitat type (Pfister and others 1977) to heavy in a grand fir (*Abies grandis*) habitat type.

Nine vegetation transects were established along 100-ft long segments of fireline in each of the three types of fireline in each of the three fuel conditions. Twenty plots (½- by ½-m) for sampling vegetation were established at 5-ft intervals along the firelines.

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[2]The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

ORIGINAL

Percentage of cover by plant species was used as a measure of plant response to disturbance. Percentage of cover is the portion of the surface covered by leaves and plant parts projected vertically to the ground. Percentage of cover by species was estimated by the following cover classes (Daubenmire 1959):

Class	Percent cover
1	0-5
2	5-25
3	26-50
4	51-75
5	76-95
6	96-100

When building fireline, the greater the disturbance, the more plants killed, hence less sprouting and more opportunity for plants to establish from seed (Arno and others 1985). Plants of each species were excavated and examined between plots along the length of each fireline section and were classified according to reproductive mode (seedling vs. sprout) into the following three classes:

Reproductive mode	Percent seedlings
Mostly vegetative	0-33
Mixed mode	34-66
Mostly seed	67-100

RESULTS

Degree of disturbance can be judged by comparing both pretreatment (1983) and posttreatment (1984) plant cover in each fire control method and fuel condition (table 1). The general pattern is a large reduction in percentage of cover for all treatments in all fuel conditions. This result can be expected because the objective of building fireline is to remove live and dead vegetation and to expose mineral soil. In the medium fuel condition, however, total cover was reduced 7 percent (from 35 to 28) on the hand-dug line but increased 38 percent (22 to 60) on the Ensign-Bickford line. This aberration may be the result of the small sample, and may not be characteristic of the treatment. There was no difference in vegetational recovery on the firelines constructed with explosives as compared to the hand-dug line.

Table 1—Vegetational cover (percent) before (1983) and after (1984) constructing fireline with handtools and explosives (water-gel, dry cord) in three fuel conditions

	Handtools		Water-gel		Dry cord	
Fuel condition	**1983**	**1984**	**1983**	**1984**	**1983**	**1984**
Light fuels						
Grass	8	7	37	20	15	11
Forbs	14	12	14	26	24	8
Shrubs	28	12	33	3	11	5
Total	50	31	84	49	50	24
Medium fuels						
Grass	5	2	12	9	3	4
Forbs	15	14	20	24	10	27
Shrubs	15	12	33	16	9	29
Total	35	28	65	49	22	60
Heavy fuels						
Grass	9	12	25	9	19	7
Forbs	45	22	56	20	31	17
Shrubs	28	11	12	4	36	18
Total	82	45	93	33	86	42

Table 2—Average number and percentage of species by reproductive mode on fireline constructed with handtools and explosives

	Handtools		Explosives	
Reproductive mode	**Species**	**Percent**	**Species**	**Percent**
Vegetative (<33 percent seedlings)	25	31	31	35
Seed (>66 percent seedlings)	42	52	42	48
Mixed mode (33-66 percent seedlings)	14	17	15	17

Degree of disturbance expressed as a percentage of plant seedlings was computed as the sum of the species in each reproductive class added over the three fuel conditions within the fire control method (table 2). A species could occur in each fuel condition, but may be classified as reproducing differently. The proportion of species reproducing from seed and sprouting is very similar on the hand-dug firelines and blasted firelines, indicating similar degree of disturbance.

CONCLUSIONS

In general, linear explosives are at least no more damaging to vegetation than hand-dug line. More detailed study with more samples and a broader look at habitat types may show a more definitive relationship. Also, other measurements and parameters may be more important in quantifying disturbance between different fireline construction methods than percentage of plant cover. For example, biomass measurement or frequency of occurrence may be useful.

The fire manager need not fear inordinate vegetational disturbance or lack of recovery from use of fireline explosives. Based on the limited work we reported here, vegetational recovery is similar on fireline made with handtools and line blasted with explosives.

REFERENCES

Anderson, Hal E. 1982. Aids to determining fuel models for estimating fire behavior. Gen. Tech. Rep. INT-122. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 22 p.

Arno, Stephen F.; Simmerman, Dennis G.; Keane, Robert E. 1985. Forest succession on four habitat types in western Montana. Gen. Tech. Rep. INT-177. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 74 p.

Barney, Richard J. 1984. Characteristics of fireline blasted with linear explosives: initial test results. Res. Note INT-345. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 8 p.

Daubenmire, R. F. 1959. Canopy coverage method of vegetation analysis. Northwest Science. 33: 43-64.

Pfister, Robert D.; Kovalchik, Bernard L.; Arno, Stephen F.; Presby, Richard C. 1977. Forest habitat types of Montana. Gen. Tech. Rep. INT-34. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 173 p.

Stockstad, Dwight S.; Kurth, Troy W.; Barney, Richard J. 1986. Fireline explosives - a second look. Fire Management Notes. 47(1): 18-21.

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